Project Based Approach to Instruction

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Engineering Education- Present Challenges

- Expectations from all the stakeholders: Changing very rapidly
- Demand of Industry, Accreditation bodies, and society : Engineering graduates need to demonstrate higher-order competencies at the end of the program
- Problems in the actual profession: Fuzzy, Open-ended, and Complex.
- Current demands from industry: Students be trained in solving such realistic problems.
- Current work places demand: Self-monitoring, Self-regulated learning
- Traditional approaches to engineering education: Don't address these concerns
- Approach to address these concern: Project based instruction, Problem based instruction, Experience based instruction

Project Based Approach to Instruction

- A project in the final year of Engineering programs: Does not, by itself, constitute Project based approach to instruction!

- Project based approach: Means that Project work plays significant role throughout the program

- Implementation details   of Project based approach vary across institutes

Key features of Project Based Approach

- Learning by doing
- Real-world problems
- Realistic solution
- Instructor as a guide / mentor
- Interdisciplinary nature of work
- Collaboration and group work

Learning by doing

- Main idea: "Doing is central to learning" and scope of "doing" is quite substantial

- "Practice" beyond the final year project work and laboratory work is the focus of the Project based approach

- This approach incorporates project work throughout the program

Real World Problems

- The real-world problems capture students' interest and attention
- The problems are complex and open-ended in order to permit a range of possible solutions (to help students with problem formulation skills)
- Problems may be specified by the instructor / department with or without the scope for choice by the students
- Department in collaboration with industry may select the problems

Realistic Solution

- Project-based approach attaches significant importance to the final solution resulting from the project
- It must be a "product" of good quality providing realistic solution to the original problem
- It must be assessed appropriately
- The "product" can be
- ➤ an artifact,
- ➤ a software package,
- ➤ a professional-quality technical report,
- ➤ or anything else as decided upfront by the department (and students if possible)

Instructor as a guide/Mentor

- Project based approach to instruction is substantially student centric.
- Role of instructor is more like a guide / mentor / facilitator.
- Shift from "sage-on-the stage" to "guide-on-the-side".
- Instructor must relinquish "control" and facilitate student autonomy.
- Instructor must be "comfortable" with students assuming responsibility for their own learning.
- Change in mindset is essential for both instructors and students

Interdisciplinary Nature of Work

- Interdisciplinary projects are preferred in the Project based approach

- Equip students with the adaptability and holistic thinking to tackle issues which defy disciplinary boundaries

- Almost all real-world work scenarios must provide the students an opportunity to work for the project of interdisciplinary in nature

Collaboration and Group Work

- Collaboration and group work is another key feature of Project-based approach

- Student teams engage in a series of interactions over extended time periods leading them to acquire and demonstrate transferable skills

  (Communication, planning, respect for different cultures and viewpoints, and team working)

- Depending on the nature of the project, collaboration could be with industry, social groups outside the institute as well

Advantages of Project Based Approach

- Improved academic achievement
- Better motivation and joy of engineering
- Better outreach
- Better opportunities for quality work by faculty
- Broader competencies: Teamwork, communication, ethical behavior, problem solving abilities, critical and innovative thinking, data collection and analysis, information search, project management, inter-personal skills, time management, self esteem

Assessment of Project Work

- At the end of project, students typically submit a written report, demonstrate the solution, and make a presentation.
- Assessing all the above outputs from the project teams requires considerable planning by instructors up front.
- Group as well as individuals need to be assessed.
- Process as well as product need to be assessed.
- Appropriate rubrics need to be developed and shared with students before the start of the project work.
- Students may need to be trained in activities like maintaining reflective journals.
- Experiences across the institutes vary.
- No unique way! Institutes need to evolve assessment methods best suited for them!!

Key Implementation Challenges (Students)

Group Work

- Not too severe for final-year students probably but significant for students in the earlier years.

- Free-riding by some group members.

- Lack of experience in group work and handling conflicts.

- Prior culture of competitive attitude while trying for admission in to top-ranking institutes and consequent lack of appreciation of the benefits of group work.

Key Implementation Challenges (Students)

Adapting to Project-based learning:

- Difficulty in adapting to the new approach of Project-based instruction: Students need to make many choices having implications in their grades later and reluctance to assume responsibility for their learning.

- Coping with relatively unstructured learning environment early in their program.

- Concerns regarding evaluation.

- Fear that the load would be "overwhelming"

Key Implementation Challenges (Faculty)

- Used to the role of mentor for final-year students but may face challenges in accepting the same role for very young and untrained students.

- Difficulty in finding resources for "heavy" project components in the curriculum.

- Overload.

- Ensuring focus on the process also.

- Managing student conflicts and expectations

Implementation Guidelines

- Substantial planning in advance (domain, resources, scope,…)
- Early discussions with external agencies (if relevant)
- Careful examination, pilot study and testing of the project ideas before offering them to the students
- Training the students and providing scaffolding as necessary
- Mentoring to facilitate collaboration also
- Fair and transparent assessment

Want to adopt Project Based Instruction?

- There are many choices at every step of the process, right from forming student teams to the final step of summative evaluation.

- The choices depend on many specific situational factors

- Choices need to be made at the level of the institute, at the level of the department, and at the level of individual instructors.

- No unique solutions

- Choices need to evolve

Acknowledgement

All the known or unknown sources used during making the presentation are duly acknowledged without the use of their data/information, the presentation would not have been so informative.

Any Questions…
Thanks……